

occupants nor adversely affect continued safe flight.

[Amdt. 29-3, 33 FR 971, Jan. 26, 1968]

### Subpart G—Operating Limitations and Information

#### § 29.1501 General.

(a) Each operating limitation specified in §§ 29.1503 through 29.1525 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in §§ 29.1541 through 29.1589.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c), Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Amdt. 29-15, 43 FR 2327, Jan. 16, 1978]

#### OPERATING LIMITATIONS

#### § 29.1503 Airspeed limitations: general.

(a) An operating speed range must be established.

(b) When airspeed limitations are a function of weight, weight distribution, altitude, rotor speed, power, or other factors, airspeed limitations corresponding with the critical combinations of these factors must be established.

#### § 29.1505 Never-exceed speed.

(a) The never-exceed speed,  $V_{NE}$ , must be established so that it is—

- (1) Not less than 40 knots (CAS); and
- (2) Not more than the lesser of—
  - (i) 0.9 times the maximum forward speeds established under § 29.309;
  - (ii) 0.9 times the maximum speed shown under §§ 29.251 and 29.629; or
  - (iii) 0.9 times the maximum speed substantiated for advancing blade tip mach number effects under critical altitude conditions.

(b)  $V_{NE}$  may vary with altitude, r.p.m., temperature, and weight, if—

- (1) No more than two of these variables (or no more than two instruments integrating more than one of these variables) are used at one time; and

(2) The ranges of these variables (or of the indications on instruments integrating more than one of these variables) are large enough to allow an operationally practical and safe variation of  $V_{NE}$ .

(c) For helicopters, a stabilized power-off  $V_{NE}$  denoted as  $V_{NE}$  (power-off) may be established at a speed less than  $V_{NE}$  established pursuant to paragraph (a) of this section, if the following conditions are met:

(1)  $V_{NE}$  (power-off) is not less than a speed midway between the power-on  $V_{NE}$  and the speed used in meeting the requirements of—

(i) § 29.67(a)(3) for Category A helicopters;

(ii) § 29.65(a) for Category B helicopters, except multi-engine helicopters meeting the requirements of § 29.67(b); and

(iii) § 29.67(b) for multi-engine Category B helicopters meeting the requirements of § 29.67(b).

(2)  $V_{NE}$  (power-off) is—

(i) A constant airspeed;

(ii) A constant amount less than power-on  $V_{NE}$ ; or

(iii) A constant airspeed for a portion of the altitude range for which certification is requested, and a constant amount less than power-on  $V_{NE}$  for the remainder of the altitude range.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c), Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Amdt. 29-3, 33 FR 971, Jan. 26, 1968, as amended by Amdt. 29-15, 43 FR 2327, Jan. 16, 1978; Amdt. 29-24, 49 FR 44440, Nov. 6, 1984]

#### § 29.1509 Rotor speed.

(a) *Maximum power-off (autorotation).* The maximum power-off rotor speed must be established so that it does not exceed 95 percent of the lesser of—

(1) The maximum design r.p.m. determined under § 29.309(b); and

(2) The maximum r.p.m. shown during the type tests.

(b) *Minimum power-off.* The minimum power-off rotor speed must be established so that it is not less than 105 percent of the greater of—

(1) The minimum shown during the type tests; and

(2) The minimum determined by design substantiation.

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(c) *Minimum power-on.* The minimum power-on rotor speed must be established so that it is—

- (1) Not less than the greater of—
  - (i) The minimum shown during the type tests; and
  - (ii) The minimum determined by design substantiation; and
- (2) Not more than a value determined under § 29.33 (a)(1) and (c)(1).

## § 29.1517 Limiting height-speed envelope.

For Category A rotorcraft, if a range of heights exists at any speed, including zero, within which it is not possible to make a safe landing following power failure, the range of heights and its variation with forward speed must be established, together with any other pertinent information, such as the kind of landing surface.

[Amdt. 29-21, 48 FR 4391, Jan. 31, 1983]

## § 29.1519 Weight and center of gravity.

The weight and center of gravity limitations determined under §§ 29.25 and 29.27, respectively, must be established as operating limitations.

## § 29.1521 Powerplant limitations.

(a) *General.* The powerplant limitations prescribed in this section must be established so that they do not exceed the corresponding limits for which the engines are type certificated.

(b) *Takeoff operation.* The powerplant takeoff operation must be limited by—

- (1) The maximum rotational speed, which may not be greater than—
  - (i) The maximum value determined by the rotor design; or
  - (ii) The maximum value shown during the type tests;
- (2) The maximum allowable manifold pressure (for reciprocating engines);
- (3) The maximum allowable turbine inlet or turbine outlet gas temperature (for turbine engines);
- (4) The maximum allowable power or torque for each engine, considering the power input limitations of the transmission with all engines operating;
- (5) The maximum allowable power or torque for each engine considering the power input limitations of the transmission with one engine inoperative;
- (6) The time limit for the use of the power corresponding to the limitations

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established in paragraphs (b)(1) through (5) of this section; and

(7) If the time limit established in paragraph (b)(6) of this section exceeds 2 minutes—

- (i) The maximum allowable cylinder head or coolant outlet temperature (for reciprocating engines); and
- (ii) The maximum allowable engine and transmission oil temperatures.

(c) *Continuous operation.* The continuous operation must be limited by—

- (1) The maximum rotational speed, which may not be greater than—
  - (i) The maximum value determined by the rotor design; or
  - (ii) The maximum value shown during the type tests;
- (2) The minimum rotational speed shown under the rotor speed requirements in § 29.1509(c).
- (3) The maximum allowable manifold pressure (for reciprocating engines);
- (4) The maximum allowable turbine inlet or turbine outlet gas temperature (for turbine engines);
- (5) The maximum allowable power or torque for each engine, considering the power input limitations of the transmission with all engines operating;
- (6) The maximum allowable power or torque for each engine, considering the power input limitations of the transmission with one engine inoperative; and
- (7) The maximum allowable temperatures for—
  - (i) The cylinder head or coolant outlet (for reciprocating engines);
  - (ii) The engine oil; and
  - (iii) The transmission oil.
- (d) *Fuel grade or designation.* The minimum fuel grade (for reciprocating engines) or fuel designation (for turbine engines) must be established so that it is not less than that required for the operation of the engines within the limitations in paragraphs (b) and (c) of this section.
- (e) *Ambient temperature.* Ambient temperature limitations (including limitations for winterization installations if applicable) must be established as the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 29.1041 through 29.1049 is shown.
- (f) *Two and one-half minute OEI power operation.* Unless otherwise authorized,